

SEQUENCE LISTING

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<120> IDENTIFICATION OF THE DOMAIN OF
 PLASMODIUM FALCIPARUM ERYTHROCYTE MEMBRANE PROTEIN 1
 (PFEMP1) THAT MEDIATES ADHESION TO CHONDROITIN SULFATE A

<130> NIH176.001C1

<150> PCT/US00/24195

<151> 2000-09-01

<150> 60/152,023

<151> 1999-09-01

<160> 11

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 Lys Val Trp Glu Ala Met Lys Cys Asp Ile Lys Tyr Leu Lys Asp Lys
 1010 1015 1020
 Ser Gly His Gln Ser Thr Gln Ser Ser Tyr Cys Gly Tyr Ser Asp His
 1025 1030 1035 1040
 Thr Pro Leu Asp Asp Tyr Ile Pro Gln Lys Leu Arg Trp Met Thr Glu
 1045 1050 1055
 Trp Ala Glu Trp Tyr Cys Lys Val Gln Lys Lys Glu Tyr Asp Lys Leu
 1060 1065 1070
 Lys Glu Lys Cys Lys Glu Cys Lys Asp Lys Asp Asn Gly Gln Gly Cys
 1075 1080 1085
 Thr Lys Glu Ser Gly Thr Gly Cys Thr Lys Cys Thr Glu Ala Cys Asn
 1090 1095 1100
 Glu Tyr Asn Asp Ile Ile Gly Leu Trp Lys Glu Gln Trp Asn Ile Ile
 1105 1110 1115 1120
 Ser Asp Lys Tyr Lys Glu Leu His Glu Gln Ala Gln Met Ser Val Ser
 1125 1130 1135
 Asn Ser Gly Ile Glu Ala Ser Ser Thr Ala Lys Asn His Ile Asp Arg
 1140 1145 1150
 Asn Val Ile Glu Phe Leu Ser Glu Leu Tyr Gln Gln Asn Gly Gly Lys
 1155 1160 1165
 Ser Asn Lys Ser Gly Thr Ser Asp Glu Ser Ala Val Ile Gly Thr Asn
 1170 1175 1180
 Thr Thr Tyr Glu Asn Val Gly Ala Tyr Leu His Asp Thr Gly Asn Phe
 1185 1190 1195 1200
 Asp Asp Cys Gln Ser Gln Asn Glu Phe Cys Asp Glu Lys Ser Asp Gly
 1205 1210 1215
 Lys Asp Asn Glu Lys Tyr Ala Phe Arg Asp Lys Pro Gln Asp His Asp
 1220 1225 1230
 Gly Ala Cys Gly Cys Lys Ser Gly Ser Lys Pro Thr Arg Val Gln Ile
 1235 1240 1245
 Lys Thr Lys Lys Lys Ala Glu Glu Lys Asp Thr Glu Cys Lys Thr Val
 1250 1255 1260
 Asn Asp Ile Leu Lys Glu Asn Asp Gly Lys Lys Gln Val Glu Asp Cys
 1265 1270 1275 1280
 His Pro Lys Lys Asn Ser Asn Gly Tyr Pro Asp Trp Gln Cys Gly Asn

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1285	1290	1295
Ile Asn Leu Val Glu Asp Pro Arg Val Cys Met Pro Pro Arg Arg Gln		
1300	1305	1310
Lys Leu Cys Val His Phe Leu Ala Asn Asp Asn Glu Ile Lys Lys Leu		
1315	1320	1325
Gln Ser Gln Val Asn Leu Lys Glu Ala Phe Ile Lys Ser Ala Ala Ala		
1330	1335	1340
Glu Thr Phe Phe Ser Trp Tyr Tyr Tyr Lys Ser Lys Asp Gly Glu Gly		
1345	1350	1355
Asn Glu Leu Asp Lys Glu Leu Lys Glu Gly Lys Ile Pro Pro Ala Phe		
1365	1370	1375
Leu Arg Ser Met Phe Tyr Thr Phe Gly Asp Tyr Arg Asp Phe Leu Phe		
1380	1385	1390
Gly Thr Asp Ile Ser Lys Gly His Gly Glu Gly Ser Lys Leu Lys Glu		
1395	1400	1405
Gln Ile Asp Ser Leu Phe Lys Asn Gly Asp Gln Lys Ser Pro Asn Gly		
1410	1415	1420
Lys Thr Arg Gln Glu Trp Trp Thr Glu His Ser His Glu Ile Trp Glu		
1425	1430	1435
Ala Met Leu Cys Ala Leu Val Lys Ile Gly Ala Lys Lys Asp Asp Phe		
1445	1450	1455
Thr Glu Asn Tyr Gly Tyr Asn Asn Val Lys Phe Ser Asp Lys Ser Thr		
1460	1465	1470
Thr Leu Glu Glu Phe Ala Lys Arg Pro Gln Phe Leu Arg Trp Leu Thr		
1475	1480	1485
Glu Trp Tyr Asp Asp Tyr Cys Tyr Thr Arg Gln Lys Tyr Leu Lys Asp		
1490	1495	1500
Val Gln Glu Lys Cys Lys Ser Asn Asp Gln Leu Lys Cys Asp Thr Glu		
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Cys Asn Lys Lys Cys Glu Asp Tyr Val Lys Tyr Met Lys Lys Lys Lys		
1525	1530	1535
Glu Trp Ile Pro Gln Asp Lys Tyr Tyr Lys Asp Glu Arg Asp Lys Lys		
1540	1545	1550
Arg Phe Asp Arg Gln His Ile Gly Val Met Val Thr Asp Tyr Thr Gly		
1555	1560	1565
Thr Asn Ala Thr Asp Tyr Leu Asn Arg Lys Phe Thr Ala Ser Cys Gly		
1570	1575	1580
Asp Lys Pro Gly Ser Ala Ser Val Val Gln Arg Asn Ile Gln Leu Leu		
1585	1590	1595
Glu Lys Gln Ala Tyr Tyr Asp Ala Asp Lys His Cys Gly Cys Thr Lys		
1605	1610	1615
Phe Ile Glu Asn Asp Asp Lys Tyr Thr Asn Ile Ser Ser Lys Asp Lys		
1620	1625	1630
Cys Lys Gly Leu Val Lys Glu Ala Asn Thr Gly Ala Ile Lys Trp Gln		
1635	1640	1645
Asn Lys Gly Pro Asn Asn Tyr Asn Asn Leu Lys Glu Leu Thr Glu Asp		
1650	1655	1660
Val Leu Phe Pro Ser Arg Arg Leu Arg Ile Cys Phe His Ala Leu Asp		
1665	1670	1675
Gly Asn Tyr Thr Asp Pro Glu Val Lys Asp Glu Asn Gly Leu Arg Lys		
1685	1690	1695
Arg Leu Met Glu Val Ala Ala Thr Glu Gly Tyr Asn Leu Gly Gln Tyr		
1700	1705	1710
Tyr Lys Glu Lys Lys Glu Lys Glu Lys Ile Lys Thr Ser Asp Ala His		
1715	1720	1725

Lys Tyr Ser Tyr Glu Val Pro Pro Cys Ser Ala Met Lys Tyr Ser Phe
 1730 1735 1740
 Tyr Asp Leu Arg Asp Ile Ile Leu Gly Ile Asp Asn Leu Glu Asp Glu
 1745 1750 1755 1760
 Lys Gln Lys Thr Glu Glu Asn Leu Lys Lys Ile Phe Asn Lys Asn Gly
 1765 1770 1775
 Thr Ser Val Gly Lys Gly Ser Asp Ser Thr Thr Gly Asn Pro Gly Ser
 1780 1785 1790
 Thr Ala Arg Lys Phe Phe Trp Asn Glu Asn Lys Glu Cys Val Trp Asn
 1795 1800 1805
 Ala Met Ile Cys Gly Tyr Lys Arg Gly Arg Asp Asp Gly Asn Ser Gly
 1810 1815 1820
 Asn Ser Ala Arg Ser Asp Glu Asp Leu Lys Lys Cys Gly Ser Val Pro
 1825 1830 1835 1840
 Ser Asp Asp Asp Tyr Pro Met Gly Lys Asn Arg Asp Glu Gly Thr Ala
 1845 1850 1855
 Tyr Gln Phe Leu Arg Trp Phe Ala Glu Trp Gly Glu Asp Phe Cys Lys
 1860 1865 1870
 His Lys Glu Lys Glu Leu Glu Lys Leu Val Gly Ala Cys Asn Asp Tyr
 1875 1880 1885
 Thr Cys Gly Asp Asn Glu Asp Lys Arg Lys Lys Cys Thr Asp Ala Cys
 1890 1895 1900
 Thr Gln Tyr Lys Lys Phe Ile Ser Glu Trp Lys Pro Gln Tyr Glu Lys
 1905 1910 1915 1920
 Gln Ile Lys Lys Tyr Gly Glu Asn Lys Asp Lys Ile Tyr Ser Glu His
 1925 1930 1935
 Pro Val Ala Lys Asp Ala Glu Asp Ala Arg Glu Tyr Leu Asp Lys Gln
 1940 1945 1950
 Leu Lys Lys Ile Cys Glu Asn Lys Ser Gly Asp Cys Glu Tyr Lys Cys
 1955 1960 1965
 Met Lys Asp Val Ser Thr Gln Arg Leu Thr Asp Gly Asn Ser Gln Asn
 1970 1975 1980
 Met Pro Ala Ser Leu Asp Asp Glu Pro Lys Glu Val Glu Gly Lys Cys
 1985 1990 1995 2000
 Asn Cys Gln Val Pro Arg Gly Pro Pro Arg Val Arg Arg Glu Thr Pro
 2005 2010 2015
 Ser Pro Arg Val Ser Leu Ile Ser Lys Ala Thr Ala Ser Lys Lys Glu
 2020 2025 2030
 Ala Lys Thr Ala Pro Pro Thr Lys Gln Pro Lys Lys Val Glu Asn Leu
 2035 2040 2045
 Thr Thr Glu Met Arg Ala Gln Thr Arg Thr Arg Arg Ala Ala Gln Gln
 2050 2055 2060
 Thr Arg Lys Arg Thr Ser Thr Ala Thr Thr Thr Glu Ser Asp Val Gly
 2065 2070 2075 2080
 Thr Met Val Lys Ala Ile Leu Ser Asn Lys Pro Asp Ser Arg Gly Gly
 2085 2090 2095
 Ile Glu Gly Cys Asn Pro Lys Thr Tyr Gly Gln Tyr Pro Lys Trp Gly
 2100 2105 2110
 Cys Ile Val Gly Lys Ser Lys Glu Asn Glu Asn Gly Ile Cys Met Pro
 2115 2120 2125
 Pro Arg Arg Lys Lys Leu Cys Ile Asn Asn Ile Gln Tyr Leu Asn Tyr
 2130 2135 2140
 Glu Thr Glu Asn Lys Arg Asp Asn Asp Ile Lys Glu Ala Phe Ile Lys
 2145 2150 2155 2160
 Cys Ala Ala Ile Glu Thr Gln Phe Leu Trp Leu Lys Tyr Ile Ile Glu

2165	2170	2175
Asn Pro Ala Ala Glu Asn Glu Leu Gln Asn Gly Thr Ile Pro Asp Glu		
2180	2185	2190
Phe Lys Arg Ile Met Tyr Tyr Thr Tyr Gly Asp Tyr Lys Asp Met Phe		
2195	2200	2205
Phe Gly Thr Asp Ile Ser Asn Asp Lys Lys Ile Ile Thr Val Thr Asn		
2210	2215	2220
Ser Val Thr Thr Ile Leu Asn Glu Asn Asn Lys Lys Lys Gln Asp Lys		
2225	2230	2235
Lys Lys Asp Glu Glu Leu Arg Lys Ile Phe Trp Glu Lys Asn Lys Lys		
2245	2250	2255
Phe Ile Trp Glu Gly Met Ile Tyr Gly Leu Thr Tyr His Leu Thr Asp		
2260	2265	2270
Glu Asn Glu Lys Glu Lys Ile Arg Asp Asn Tyr Gln Tyr Asn Asp Met		
2275	2280	2285
Thr Lys Leu Thr Pro Ser Leu Glu Glu Phe Val Lys Arg Pro Gln Phe		
2290	2295	2300
Leu Arg Trp Phe Thr Glu Trp Ala Glu Glu Phe Cys Asn Lys Arg Lys		
2305	2310	2315
Glu Gln Leu Leu Lys Leu Glu Ala Gly Cys Lys Glu Tyr Glu Cys Asn		
2325	2330	2335
Gly Ser Asn Asp Gly Lys Thr Gln Glu Cys Ala Glu Ala Cys Val Thr		
2340	2345	2350
Tyr Gln Asn Phe Ile Lys Lys Trp Lys Thr Glu Tyr Glu Arg Gln Arg		
2355	2360	2365
Glu Lys Phe Lys Lys Asp Lys Asp Gly Lys Lys Tyr Lys Asp Tyr Pro		
2370	2375	2380
Ser Thr Glu Arg Asp Ile Glu Lys Ala Thr Cys Ala His Glu Tyr Leu		
2385	2390	2395
Asn Met Lys Leu Lys Glu Leu Cys Gly Asn Lys Asp Cys Ser Cys Met		
2405	2410	2415
Gln Lys Pro Ser Ser Gln Leu Pro Lys Thr Thr Gln Gln Ser Gln Ser		
2420	2425	2430
Ser Asp Ala Asn Asp Met Pro Glu Ser Leu Asp Tyr Val Pro Glu Glu		
2435	2440	2445
Phe Asn Lys Cys Glu Cys Pro Glu Leu Ser Lys Lys Gly Ser Met Ile		
2450	2455	2460
His Thr Lys Lys Ile Thr Glu Pro Lys Ile Pro Met Asn Cys Val Glu		
2465	2470	2475
Lys Ala Ala Tyr Tyr Leu Ser Lys Glu Ala Glu Asn Asn Met Asp Ile		
2485	2490	2495
Thr Leu Lys Glu Lys Phe Ile Pro Ile Glu Ser Thr Lys Glu Lys Glu		
2500	2505	2510
Ser Lys Asn Ser Trp Thr Asn Asn Asn Pro Cys Asp Pro Lys Lys Pro		
2515	2520	2525
Tyr Ala Pro Asp Lys Tyr Ile Gly Arg Arg Asn Pro Cys Glu Asn Arg		
2530	2535	2540
Glu Glu Asn Arg Phe Lys Val Asp Tyr Glu Trp Lys Cys Tyr Lys Asn		
2545	2550	2555
Ser Lys Phe Tyr Gln Glu Lys Lys Arg Val Cys Val Pro Pro Arg Arg		
2565	2570	2575
Glu His Met Cys Leu Arg Asn Leu Asp Glu Ile Lys Ile Glu Arg Leu		
2580	2585	2590
Lys Asp Ser Asn Tyr Leu Leu Lys Met Val Arg Arg Thr Ala Arg Asn		
2595	2600	2605

Glu Gly Ile Asp Ile Ile Lys Asn Phe Asn Ser Glu Asn Gly Cys Ala
 2610 2615 2620
 Met Asn Pro Ile Cys Asp Thr Met Lys Tyr Ser Phe Ala Asp Leu Gly
 2625 2630 2635 2640
 Asp Ile Val Arg Gly Thr Asp Met Leu Arg Ile Gly Gly Tyr Leu Pro
 2645 2650 2655
 Pro Val Glu Ile Lys Leu Tyr Lys Val Phe Glu Tyr Ile Tyr Gly Lys
 2660 2665 2670
 Trp Arg Asn Lys Asn Lys Gly Arg Asn Lys Tyr Asn Asp Val Gln Thr
 2675 2680 2685
 Phe Arg Ser Ala Trp Trp Asp Ala Asn Arg Lys Asp Ile Trp Lys Ala
 2690 2695 2700
 Met Thr Cys Lys Ala Pro Glu Asp Ala Lys Leu Phe Arg Lys Gly Arg
 2705 2710 2715 2720
 Met Asp Gly Phe Glu Arg Ile Thr Leu Ile Gln Asp Lys Cys Gly His
 2725 2730 2735
 Lys Asp Asp Pro Pro Val Asp Asp Tyr Ile Pro Gln Arg Phe Arg Trp
 2740 2745 2750
 Met Thr Glu Trp Ser Glu Tyr Tyr Cys Lys Ala Leu Met Glu Glu Leu
 2755 2760 2765
 Glu Lys Phe Lys Lys Ser Cys Asp His Cys Lys Thr Ser Asp Arg Cys
 2770 2775 2780
 Lys Asn Asp Tyr Asp Glu Asn Lys Cys Glu Gln Cys Lys Thr Arg Cys
 2785 2790 2795 2800
 Gln Glu Tyr Lys Asn Phe Val Leu Lys Trp Lys Ser Leu Phe Asp Ile
 2805 2810 2815
 Gln Ser Asn Lys Tyr Lys Glu Leu Tyr Glu Gln Pro Ile Tyr Thr Lys
 2820 2825 2830
 Ile Ser Thr Tyr Asp His Val Gln Asn Phe Val Gln Lys Leu Lys Thr
 2835 2840 2845
 Phe Lys Ser Glu Cys Ser Val Glu Ser Phe Ser Glu Tyr Leu His Glu
 2850 2855 2860
 Thr Ser Lys Cys Leu Asn Tyr Lys Phe Asn Glu Asn Asp Gly Ser Ser
 2865 2870 2875 2880
 Asn Ile Arg Thr Tyr Ala Phe Glu Glu Thr Pro Lys Ser Tyr Lys Glu
 2885 2890 2895
 Ala Cys Ser Cys Thr Leu Pro Ser Lys Asn Pro Leu Asp Asn Cys Pro
 2900 2905 2910
 Thr Asp Gln Asn Lys Asp Gly Cys Lys Glu Leu Gln Thr Phe Thr Phe
 2915 2920 2925
 Cys Ser Lys Asn Asp Tyr Asp Asn Asn Leu Asp Asn Trp Asn Ala Tyr
 2930 2935 2940
 Leu Val Leu Asn Ser Ser Asp Asp Asn Lys Gly Val Leu Ile Pro Pro
 2945 2950 2955 2960
 Arg Arg Arg His Leu Cys Thr Arg Pro Ile Thr Ala Tyr Asn Tyr Arg
 2965 2970 2975
 Lys Gly Asp Lys Glu Ile Leu Lys Lys Lys Leu Leu Thr Ser Ala Phe
 2980 2985 2990
 Ser Gln Gly Gln Leu Leu Gly Gln Lys Tyr Lys Ser Glu Glu Glu Leu
 2995 3000 3005
 Cys Phe Glu Ala Met Lys Tyr Ser Tyr Ala Asp Tyr Ser Asp Ile Ile
 3010 3015 3020
 Lys Gly Thr Asp Met Met Asp Thr Ser Leu Ser Glu Lys Ile Lys Lys
 3025 3030 3035 3040
 Ile Phe Glu Thr Ser Asn Glu Ala Thr Glu Asn Arg Lys Thr Trp Trp

3045	3050	3055
Glu Asn Asn Arg Arg Gln Ile Trp His Ala Met Leu Cys Gly Tyr Lys		
3060	3065	3070
Ile Ala Thr Ser Lys Val Thr Leu Asp Glu Gly Trp Cys Gln Leu Pro		
3075	3080	3085
Lys Asp Glu Glu Thr Asn Gln Phe Leu Arg Trp Leu Ile Glu Trp Ala		
3090	3095	3100
Lys Gln Ala Cys Lys Glu Lys Lys His Val Ser Asp Ser Leu Lys Thr		
3105	3110	3115
Lys Cys Pro Arg Ser Asn Glu Asp Asn Phe Glu Ala Ser Glu Leu Leu		
3125	3130	3135
Arg Gln Pro Gly Cys Gln Asn Asp Ile Arg Lys Tyr Ile Ser Leu Asn		
3140	3145	3150
Ile Leu Ile Lys Asn Thr Met Glu Asn Leu Asn Ile Lys Tyr Lys Gln		
3155	3160	3165
Leu Lys Asp Gln Ser Ser Gly Asn Ile Asp Asn Lys Pro Ser Glu Glu		
3170	3175	3180
Asn Val Gln Ser Tyr Ile Lys Ser Lys Asp Ser Gln Cys Ala Leu Glu		
3185	3190	3195
Leu Asn Asp Ile Asn Glu Ile Val Thr Gly Thr Lys Asn Asn Glu Asn		
3205	3210	3215
Asn Glu Phe Lys Glu Val Leu Lys Lys Leu Tyr Pro Gly Leu Tyr Phe		
3220	3225	3230
Val Glu Asp Glu Thr His Lys Asn His Val Leu Asp Gly Asn Ile Lys		
3235	3240	3245
Glu Glu Glu Gln Thr Val Arg Pro Lys Ala Leu Tyr Phe Phe Thr Pro		
3250	3255	3260
His Val Asp Ser Phe Tyr Gln Ala Pro Leu Phe Ser Thr His Arg Val		
3265	3270	3275
Ala Gln Tyr Asp Pro Lys Asn Asp Ile Leu Lys Ser Ser Ile Ser Val		
3285	3290	3295
Val Ile Val Ser Ala Leu Gly Leu Ile Ala Leu His Phe Met Lys Lys		
3300	3305	3310
Lys Phe Lys Ser Ser Val Asp Leu Leu Arg Ile Leu Asn Ile Pro Gln		
3315	3320	3325
Gly Glu Tyr Gly Met Pro Thr Leu Glu Ser Lys Asn Arg Tyr Ile Pro		
3330	3335	3340
Tyr Arg Ser Gly Pro Tyr Lys Gly Lys Thr Tyr Ile Tyr Met Glu Gly		
3345	3350	3355
Asp Thr Ser Gly Asp Glu Asp Lys Tyr Met Trp Asp Leu Ser Ser Ser		
3365	3370	3375
Asp Ile Thr Ser Ser Glu Ser Glu Tyr Glu Glu Leu Asp Ile Asn Asp		
3380	3385	3390
Ile Tyr Val Pro Gly Ser Pro Lys Tyr Lys Thr Leu Ile Glu Val Val		
3395	3400	3405
Leu Glu Pro Ser Lys Arg Asp Ile Pro Ser Asp Asp Thr Pro Ser Asn		
3410	3415	3420
Asp Thr Pro Arg Thr Asn Arg Phe Ile Asp Asp Glu Trp Asn Glu Leu		
3425	3430	3435
Lys His Asp Phe Val Ser Gln Tyr Leu Pro Asn Thr Glu Pro Asn Asn		
3445	3450	3455
Asn Tyr Lys Ser Ala Asp Ile Pro Met Asn Thr Glu Pro Asn Thr Leu		
3460	3465	3470
Tyr Ser Asp Asn Pro Glu Glu Lys Pro Phe Ile Ile Ser Ile His Asp		
3475	3480	3485

Arg Asp Leu Tyr Thr Gly Lys Glu Ile Ser Tyr Asn Ile Asn Met Ser
 3490 3495 3500
 Thr Asn Thr Asn Asn Asp Ile Pro Met Asn Ala Arg Asn Asp Ser Tyr
 3505 3510 3515 3520
 Arg Gly Ile Asp Leu Ile Asn Asp Ser Leu Val Val Leu Asn Leu Leu
 3525 3530 3535
 Ile Tyr Met Met Lys Tyr
 3540

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 <212> PRT
 <213> Plasmodium falciparum

<400> 3
 Glu Ala Glu Lys Glu Leu Lys Glu Gly Lys Ile Pro Glu Gly Phe Lys
 1 5 10 15
 Arg Gln Met Phe Tyr Thr Phe Gly Asp Tyr Arg Asp Ile Leu Phe Gly
 20 25 30

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 <212> PRT
 <213> Plasmodium falciparum

<400> 4
 Lys Glu Leu Lys Glu Gly Lys Ile Pro Glu
 1 5 10

<210> 5
 <211> 4
 <212> PRT
 <213> Plasmodium falciparum

<400> 5
 Lys Glu Gly Lys
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<210> 6
 <211> 6
 <212> PRT
 <213> Plasmodium falciparum

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<223> misc_difference

<221> VARIANT
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<400> 6

Lys Xaa Asn Gly Xaa Asn

1 5

<210> 7

<211> 294

<212> PRT

<213> Plasmodium falciparum

<400> 7

Val Leu Gln Gln Lys Ser Asn Gly Ser Ile Asp Asn Cys Asn Ala Lys

1 5 10 15

Asn Arg Lys Lys Asn Glu Trp Gln Cys Asp Lys Asn Thr Phe Val Asp

20 25 30

Gly Asn Glu Gly Val Cys Met Pro Pro Arg Arg Lys Ser Ile Cys Ile

35 40 45

His Asn Leu Thr Leu Glu Glu Gln Thr Lys Asn Lys Tyr Gln Leu Arg

50 55 60

Glu Ala Phe Ile Lys Cys Ala Ala Lys Glu Thr Asn Leu Leu Trp Asp

65 70 75 80

Lys Tyr Lys Asn Asp Lys Asn Glu Ala Glu Glu Leu Leu Lys Lys Gly

85 90 95

Lys Ile Pro Glu Asp Phe Met Arg Ile Met Phe Tyr Thr Phe Gly Asp

100 105 110

Phe Arg Asp Phe Cys Leu Glu Asn Asp Met Gly Lys Asp Val Asp Lys

115 120 125

Val Lys Lys Asn Ile Asn Lys Val Phe Asn Asn Ser Ser Lys Arg Gly

130 135 140

Phe Lys Lys Ile Asp Pro Glu Asn Trp Trp Asn Glu Asn Gly Pro Gln

145 150 155 160

Ile Trp Asn Gly Met Leu Cys Ala Leu Ile His Ala Asp Thr Lys Asp

165 170 175

Ser Ile Lys Asn Lys Asp Asn Tyr Lys Tyr Glu Lys Val Thr Ile Leu

180 185 190

Ala Lys Arg Asp Gly Ser Asn Gly Met Thr Leu Ser Glu Phe Ala Lys

195 200 205

Lys Pro Lys Phe Leu Arg Trp Phe Val Glu Trp Tyr Asp Asp Tyr Cys

210 215 220

Lys Glu Arg Gln Lys Tyr Leu Thr Glu Val Ala Ser Thr Cys Lys Ser

225 230 235 240

Ile Asp Gly Gly Gln Leu Lys Cys Asp Arg Gly Cys Asn Asn Lys Cys

245 250 255

Asp Glu Tyr Lys Lys Tyr Met Arg Lys Lys Lys Glu Glu Trp Asn Leu

260 265 270

Gln Asp Lys Tyr Tyr Lys Asp Lys Arg Glu Asn Lys Gly Ile Asp Lys

275 280 285

Gly Pro Ile Gly Ile Ile

290

<210> 8

<211> 407

<212> PRT

<213> Plasmodium falciparum

<400> 8

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 Tyr Pro Thr Lys Asn Asp Tyr Pro Gly Trp Asn Cys Thr Asp Lys Val
 20 25 30
 Ile Asn Arg Glu Glu Gly Ser Cys Met Pro Pro Arg Arg Gln Lys Leu
 35 40 45
 Cys Ile His Asn Leu Glu His Leu Ser Glu Lys Ala Thr Glu Thr Glu
 50 55 60
 Leu Arg Lys Ala Phe Ile Glu Cys Ala Ala Ile Glu Thr Phe Trp Leu
 65 70 75 80
 Trp Asp Lys Tyr Lys Glu Asp Lys Lys Asp Glu Lys Lys Thr Glu Gly
 85 90 95
 Gly Gly Ile Ser Asp Asp Pro Asp Asp Pro Gln Lys Lys Leu Glu Gly
 100 105 110
 Gly Thr Ile Pro Glu Asp Phe Lys Arg Gln Met Phe Tyr Thr Tyr Gly
 115 120 125
 Asp Tyr Arg Asp Phe Leu Phe Gly Thr Asp Ile Ser Lys Gly His Gly
 130 135 140
 Lys Glu Ser Ala Leu Gly Lys Lys Ile Asp Ser Leu Phe Lys Asn Gly
 145 150 155 160
 Asp Gln Lys Ser Pro Ser Gly Lys Thr Pro Thr Glu Trp Trp Asn Asp
 165 170 175
 Tyr Gly Pro Asp Ile Trp Lys Gly Met Val Cys Gly Leu Ser His His
 180 185 190
 Ile Lys Asn Gly Asn Lys Glu Gln Leu Arg Lys Asn Leu Thr Asp Asn
 195 200 205
 Asn Lys Tyr Thr Lys Ile Ser Ser Lys Leu Glu Asp Phe Ala Ser Arg
 210 215 220
 Pro Gln Phe Leu Arg Trp Phe Ile Glu Trp Gly Asp Gln Phe Cys Arg
 225 230 235 240
 Glu Arg Val Val Lys Ile Asn Gln Leu Lys Thr Gly Cys Asn Glu Tyr
 245 250 255
 Glu Cys Gly Ser Gln Glu Asn Gly Lys Lys Glu Ala Cys Lys Asn Ala
 260 265 270
 Cys Glu Ala Tyr Lys Ser Trp Leu Lys Asp Trp Lys Asp Gln Tyr Glu
 275 280 285
 Gln Gln Thr Ala Lys Phe Asp Lys Asp Lys Lys Asp Lys Lys Phe Asp
 290 295 300
 Gly Thr Ser Ala Glu Val Asp Val Ala Ala Val Ser Ser Val His Glu
 305 310 315 320
 Tyr Leu Gln Glu Glu Leu Lys Asn Leu Cys Thr Lys Gly Asp Cys Ala
 325 330 335
 Cys Met Glu Lys Pro Ser Ala Gln Asp Glu Glu Thr Glu Leu Leu Gly
 340 345 350
 Gly Asn Tyr Phe Pro Glu Ala Met Asp Tyr Pro Pro Lys Glu Ile Gly
 355 360 365
 Glu Arg Cys Lys Cys Ala Ile Pro Ser Glu Pro Met Ser Cys Val Glu
 370 375 380
 Gln Ile Ala Lys His Leu Arg Glu Lys Ala Glu Lys Asn Val Lys Ile
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 Tyr Glu Ser Ser Leu Lys Gly
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 <211> 351
 <212> PRT
 <213> Plasmodium falciparum

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 35 40 45
 Gln Asn Leu Cys Val His Tyr Leu Thr Lys Leu Asn Asp Asp Ser Lys
 50 55 60
 Glu Glu Asp Leu Arg Glu Ala Phe Ile Lys Ser Ala Ala Ala Glu Thr
 65 70 75 80
 Phe Leu Leu Arg Gln Tyr Tyr Asn Ser Lys Asn Val Glu Asp Asp Lys
 85 90 95
 Ile Leu His Arg Asp Met Ile Pro Pro Glu Phe Phe Arg Ser Met Phe
 100 105 110
 Tyr Thr Phe Gly Asp Tyr Arg Asp Ile Cys Leu Asp Thr Asp Ile Ser
 115 120 125
 Glu Lys Ile Ala Asp His Asp Val Thr Thr Ala Lys Lys Lys Ile Thr
 130 135 140
 Ala Val Phe Gln Lys Ile Gly Ser Lys Thr Thr Asn Gly Lys Lys Val
 145 150 155 160
 Leu Glu Arg Glu Gly Trp Trp Lys Glu Tyr Gly Leu Ser Ile Trp Lys
 165 170 175
 Gly Met Leu Cys Ala Leu Ser Tyr Asn Thr Glu Thr Lys Lys Met Asp
 180 185 190
 Glu Gly Val Arg Thr Tyr Leu Met Lys Tyr Ile Tyr Lys Asn Asn Asp
 195 200 205
 Ile Lys Glu Tyr Leu Glu Glu Phe Ala Ser Arg Pro Pro Phe Leu Arg
 210 215 220
 Trp Val Thr Glu Trp Gly Glu Asp Phe Val Lys Asn Arg Lys Lys Glu
 225 230 235 240
 Leu Val Ser Leu Lys Lys Lys Cys Asp Ser Cys Thr Leu Arg Asn Asn
 245 250 255
 Gly Thr Ser Asn Lys Thr Cys Asp Asp Asn Glu Asn Cys Gly Ala Cys
 260 265 270
 Lys Thr Gln Cys Glu Lys Tyr Lys Lys Trp Met Glu Arg Trp Lys Lys
 275 280 285
 His Tyr Ser Ser Gln Lys Lys Lys Phe Gln Leu Tyr Lys Asn Ser Ala
 290 295 300
 Thr Tyr Asn Asn Gly Leu Ala Val Lys Glu Ala Asn Ser Glu Thr Tyr
 305 310 315 320
 Lys Asn Asp Pro Glu Val Thr Glu Ala Asn Ser Ala Lys His Ala Arg
 325 330 335
 Asp Tyr Leu Lys Thr Gln Leu Glu Asn Met Ile Cys Thr Asn Gly
 340 345 350

<210> 10

<211> 311
 <212> PRT
 <213> Plasmodium falciparum

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 Asp Lys Tyr Pro Gly Trp Asp Cys Asn Ser Gln Ile His Thr Thr His
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 Asn Gly Ala Cys Met Pro Pro Arg Arg Gln Lys Leu Cys Val Ser Gly
 35 40 45
 Leu Thr Lys Thr Asp Arg Ile Lys Ala Ile Glu Tyr Ile Arg Thr Glu
 50 55 60
 Phe Ile Lys Ser Ala Ala Ile Glu Thr His Phe Ala Trp Asp Arg Tyr
 65 70 75 80
 Lys Glu Asp Asn Gly Glu Ala Glu Ala Glu Leu Lys Asn Gly Asn Ile
 85 90 95
 Pro Glu Gly Phe Lys Arg Gln Met Tyr Tyr Thr Phe Gly Asp Tyr Arg
 100 105 110
 Asp Ile Phe Phe Gly Arg Asp Ile Ser Thr His Ala Tyr Ile Ser Gly
 115 120 125
 Val Ser Pro Lys Val Ile Thr Ile Leu Glu Lys Glu Asn Asp Ala Lys
 130 135 140
 Tyr Ala Ala Lys Gln Asn Ser Asn Asn Glu Leu Leu Asp Asp Trp Trp
 145 150 155 160
 Asp Gln His Gly Lys Asp Ile Trp Glu Gly Met Leu Cys Ala Leu Thr
 165 170 175
 His Lys Ile Ser Asp Glu Glu Lys Lys Lys Glu Ile Lys Asn Lys Tyr
 180 185 190
 Ser Tyr Lys Lys Leu Asn Glu Ser Pro Lys Gly Ser Asn Lys Val Glu
 195 200 205
 Asp Phe Ala Lys Lys Pro Gln Phe Leu Arg Trp Phe Ile Glu Trp Gly
 210 215 220
 Asp Glu Phe Cys Ala Gln Arg Glu Glu Lys Glu Ala Lys Val Lys Val
 225 230 235 240
 Ser Cys Ser Asp Ala Lys Asp Tyr Asp Gly Cys Lys Asn Thr Lys Ser
 245 250 255
 Asn Ala Ser Cys Val Ser Ala Cys Lys Val Tyr Glu Asp Tyr Ile Thr
 260 265 270
 Lys Lys Lys Val Glu Tyr Thr Lys Gln Lys Gly Lys Phe Asp Ala Glu
 275 280 285
 Lys Ile Thr Asp Lys Glu Gly Tyr Glu Gly Phe Ser Thr Lys Asp Ala
 290 295 300
 Ser Glu Tyr Leu Lys Lys Lys
 305 310

<210> 11
 <211> 308
 <212> PRT
 <213> Plasmodium falciparum

<400> 11
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Tyr Pro Asp Trp Asp Cys Lys Lys Asn Ile Asp Asn Ser His Ser Gly
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 Ala Cys Met Pro Pro Arg Arg Gln Lys Leu Cys Val Arg Asp Leu Thr
 35 40 45
 Gln Gly Gly Glu Ile Arg Lys Pro Glu Asp Ile Leu Thr Lys Phe Ile
 50 55 60
 Asn Cys Ala Ala Lys Glu Thr His Phe Ala Trp His Lys Tyr Lys Lys
 65 70 75 80
 Asp Asn Val Asn Ala Glu Asn Glu Leu Lys Ser Gly Lys Ile Pro Glu
 85 90 95
 Gly Phe Arg Lys Gln Met Tyr Tyr Thr Phe Gly Asp Phe Arg Asp Ile
 100 105 110
 Phe Phe Gly Thr Asp Ile Ser Ser Cys Arg Tyr Ile Lys Asp Thr Ser
 115 120 125
 Gln Thr Ile Lys Ser Lys Leu Gly Asp Gln Ala Thr Thr Glu Lys Gly
 130 135 140
 Asp Thr His Ile Asp Asp Asn Lys Lys Leu Gln Glu Trp Trp Thr Ile
 145 150 155 160
 His Gly Pro Lys Ile Trp Glu Gly Met Leu Cys Ala Leu Thr Asn Gly
 165 170 175
 Leu Ser Glu Ser Glu Lys Lys Asn Ile Leu Gln Asp Tyr Ser Tyr Asn
 180 185 190
 Lys Leu Asn Asn Ala Glu Lys Asp Asp Cys Cys Leu Glu Lys Phe Ala
 195 200 205
 Ser Lys Pro Gln Phe Leu Arg Trp Tyr Val Glu Trp Ser Asp Glu Phe
 210 215 220
 Cys Arg Glu Arg Lys Lys Leu Glu Asp Lys Val Glu Asp Val Cys Ile
 225 230 235 240
 Lys Ala Lys Asp Tyr Glu Gly Cys Lys Asn Asn Lys Ser Asn Asn Ser
 245 250 255
 Cys Val Lys Val Cys Lys Glu Tyr Glu Asn Tyr Ile Thr Gly Lys Lys
 260 265 270
 Thr Gln Tyr Glu Ser Gln Glu Gly Lys Phe Asn Thr Glu Lys Arg Gln
 275 280 285
 Lys Lys Pro Glu Tyr Asn Ser Tyr Ser Lys Lys Asp Ala Ser Glu Tyr
 290 295 300
 Leu Lys Asp Lys
 305

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